WHAT IS CLAIMED IS:

1.   A method for image enhancement of a digital image comprising a set of image pixels, the method comprising applying an inverse histogram-based mapping function to the image pixels.

5   2.   A method for image enhancement of a digital image comprising image pixels, the method comprising applying an inverse histogram-based mapping function to a set of said image pixels.

3.   A method according to claim 2, wherein the set of said image pixels

10   comprises all image pixels of the digital image.

4.   A method according to claim 2, wherein the set of said image pixels comprises a part of all image pixels of the digital image.

15   5.   A method according to claim 2, wherein formation of the inverse histogram-based mapping function comprises:

-    constructing a histogram of pixel values from at least part of said image pixels,

-    developing an inverse histogram from said histogram,

20   -   forming a cumulative inverse histogram from said inverse histogram,

-    deriving an inverse mapping function from said cumulative inverse histogram

6.   A method according to claim 5, wherein the step of constructing a

25   histogram of pixel values comprises the steps of:

-    defining a set of pixel value ranges;

-    for each pixel value range, counting the number of image pixels from said at least part of said image pixels that have values within that range.

30   7.   A method according to claim 6, wherein said step of developing an inverse histogram from said histogram comprises the steps of:

-       identifying a pixel value range having a maximum number of image pixels;

-       for each pixel value range, subtracting the number of image pixels within that range from said maximum number, thus modifying the number of

5   image pixels within each pixel value range.

8.   A method according to claim 6, wherein said step of developing an inverse histogram from said histogram comprises the steps of:

-       defining a reference value;

10   -   for each pixel value range, subtracting the number of image pixels within that range from said reference value, thus modifying the number of image pixels within each pixel value range.

9.   A method according to claim 6, wherein said step of developing an

15   inverse histogram from said histogram comprises the steps of:

-       identifying a pixel value range having a maximum number of image pixels;

-       defining a reference value greater than said maximum number;

-       for each pixel value range, subtracting the number of image pixels

20   within that range from said reference value, thus modifying the number of image pixels within each pixel value range.

10.   A method according to any of claims 7, 8 or 9, wherein said step of forming a cumulative inverse histogram comprises the step of:

25   -   for each pixel value range, adding to the number of image pixels within that range, modified during said step of developing an inverse histogram, the number of image pixels modified during said step of developing an inverse histogram in all pixel value ranges comprising smaller pixel values than that range.

30

11.   A method according to claim 10, wherein said inverse mapping function is derived from said cumulative inverse histogram using the number of image pixels within each pixel value range of said cumulative inverse histogram.

5   12.   A method according to claim 11, wherein said inverse mapping function is derived from said cumulative inverse histogram by interpolating between pixel value ranges of said cumulative inverse histogram.

13.   A method according to any preceding claim, wherein said inverse
10   mapping function is scaled to a predetermined maximum value.

14.   A method according to any of claims 5 to 13, wherein said histogram of pixel values is processed to form a modified histogram before said step of developing an inverse histogram.

15

15.   A method according to any of claims 5 to 14, wherein said inverse histogram is processed to form a modified inverse histogram before said step of forming a cumulative inverse histogram.

20   16.   A method according to any of claims 5 to 15, wherein said cumulative inverse histogram is processed to form a modified cumulative inverse histogram before said step of deriving an inverse mapping function.

17.   A method according to claim 2, wherein formation of the inverse
25   histogram-based mapping function comprises:

-       constructing a histogram of pixel values from at least part of said image pixel values,

-       forming a cumulative histogram from said histogram,

-       deriving a mapping function from the cumulative histogram,

30   -   forming an inverse mapping function from said mapping function,

18.   A method according to claim 17, wherein said step of forming an inverse mapping function from said mapping function comprises the steps of:

-    differentiating said mapping function to form a differentiated mapping function;

5   -   finding the maximum value of said differentiated mapping function;

-    subtracting said maximum value from said differentiated mapping function and integrating the result.

19.   A method according to claim 17, wherein the step of constructing a

10   histogram of pixel values comprises the steps of:

-    defining a set of pixel value ranges;

-    for each pixel value range, counting the number of image pixels from said at least part of said image pixels that have values within that range.

15   20.   A method according to claims 19, wherein said step of forming a cumulative histogram comprises the step of:

-    for each pixel value range, adding to the number of image pixels within that range the number of image pixels in all pixel value ranges comprising smaller pixel values than that range.

20

21.   A method according to claim 20, wherein said mapping function is derived from said cumulative histogram using the number of image pixels within each pixel value range of said cumulative histogram.

25   22.   A method according to claim 21, wherein said mapping function is derived from said cumulative histogram by interpolating between pixel value ranges of said cumulative histogram.

23.   A method according to any of claims 17 to 22, wherein said histogram

30   of pixel values is processed to form a modified histogram before said step of developing a cumulative histogram.

24.   A method according to any of claims 17 to 23, wherein said cumulative histogram is processed to form a modified cumulative histogram before said step of deriving a mapping function.

5   25.   A method according to any of claims 17 to 24, wherein said mapping function is processed to form a modified mapping function before said step of forming an inverse mapping function.

26.   A method according to any preceding claim, wherein said inverse

10   mapping function is modified to form a modified inverse mapping function and said modified inverse mapping function is applied to the set of said image pixels.

27.   A method according to any of claims 5 to 26, wherein said histogram is

15   constructed from all image pixels of said digital image.

28.   A method according to any of claims 5 to 26, wherein said histogram is constructed from a part of all image pixels of said digital image.

20   29.   A method according to any preceding claim, wherein said inverse histogram-based mapping function is applied to the set of said image pixels prior to or after applying another image processing function.

30.   A method according to claim 29, wherein said other image processing

25   function has the effect of increasing pixel value variation.

31.   A method according to any preceding claim, wherein the inverse histogram-based mapping function is applied to the set of said image pixels prior to or after applying an edge enhancement function.

30

32.   A method according to any preceding claim, wherein the inverse histogram-based pixel mapping function is applied in an original signal branch

and an edge enhancement unit is applied in a branch parallel to the original signal branch.

33. A method according to any preceding claim, wherein the inverse
5   histogram-based mapping function is applied in an original signal branch and in a branch parallel to the original signal branch having an edge enhancement unit.

34. Image processing means for enhancing a digital image comprising a
10   set of image pixels, the processing means comprising means for applying an inverse histogram-based mapping function to the image pixels.

35. An image processor for enhancing a digital image comprising image pixels, wherein the image processor comprises means for applying an inverse
15   histogram-based mapping function to a set of said image pixels.

36. An image processor according to claim 35, wherein the image processor comprises:

-       means for constructing a histogram of pixel values from at least part of
20   said image pixels,

-       means for developing an inverse histogram from said histogram,

-       means for forming a cumulative inverse histogram from said inverse histogram,

-       means for deriving an inverse mapping function from said cumulative
25   inverse histogram

37. An image processor according to claim 36, wherein the image processor comprises means for forming a modified histogram from said histogram of pixel values.

30

38. An image processor according to claim 36 or 37, wherein the image processor comprises means for forming a modified inverse histogram from said inverse histogram.

5   39. An image processor according to any of claims 36 to 38, wherein the image processor comprises means for forming a modified cumulative inverse histogram from said cumulative inverse histogram.

40. An image processor according to claim 35, wherein the image
10   processor comprises:

- means for constructing a histogram of pixel values from at least part of said image pixel values,

- means for forming a cumulative histogram from said histogram,

- means for deriving a mapping function from the cumulative histogram,

15   - means for forming an inverse mapping function from said mapping function.

41. An image processor according to claim 40, wherein the image processor comprises means for forming a modified histogram from said
20   histogram of pixel values.

42. An image processor according to claim 40 or 41, wherein the image processor comprises means for forming a modified cumulative histogram from said cumulative histogram.

25

43. An image processor according to any of claims 40 to 42, wherein the image processor comprises means for forming a modified mapping function from said mapping function.

30   44. An image processor according to any of claims 35 to 43, wherein the image processor comprises means for forming a modified inverse mapping function from said inverse mapping function.

45. A portable radio communication device including image processing means for enhancing a digital image comprising a set of image pixels, the processing means comprising means for applying an inverse histogram mapping function to the image pixels.

5

46. A computer program product having a computer usable medium having computer readable program code embodied therein for image enhancement of a digital image comprising a set of image pixels, the code comprising applying an inverse histogram-based mapping function to the image pixels.

10

47. A method for image enhancement of a digital image comprising a set of image pixels, the method comprising applying, in a branch of an edge enhancement unit that is parallel to an original image branch, a histogram-based pixel mapping function to said set of image pixels prior to applying a

15 highpass filter in said branch.

48. A method for image enhancement of a digital image comprising image pixels, the method comprising applying, in a signal branch parallel to an original image branch, a histogram-based pixel mapping function to a set of

20 said image pixels prior to applying an image processing function that has the effect of increasing pixel value variation.

49. A method for image enhancement of a digital image comprising image pixels, the method comprising applying, a histogram-based pixel mapping

25 function to a set of said image pixels prior to applying an image processing function that has the effect of increasing pixel value variation.

add
A8